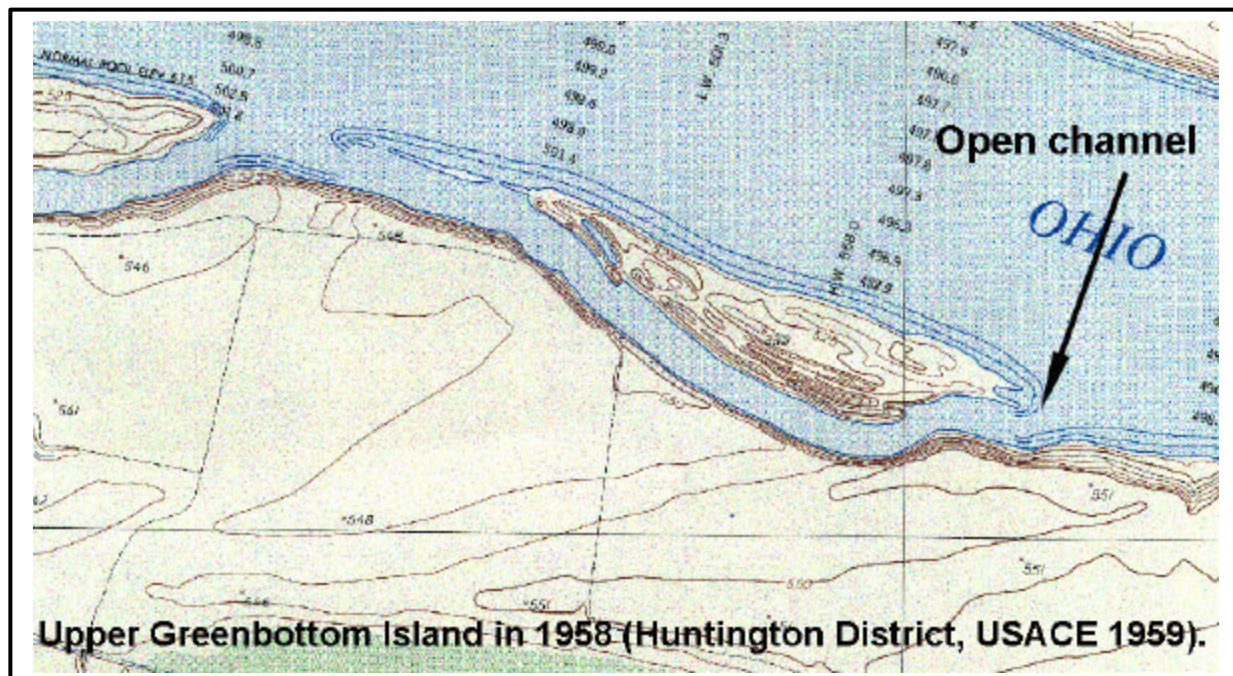
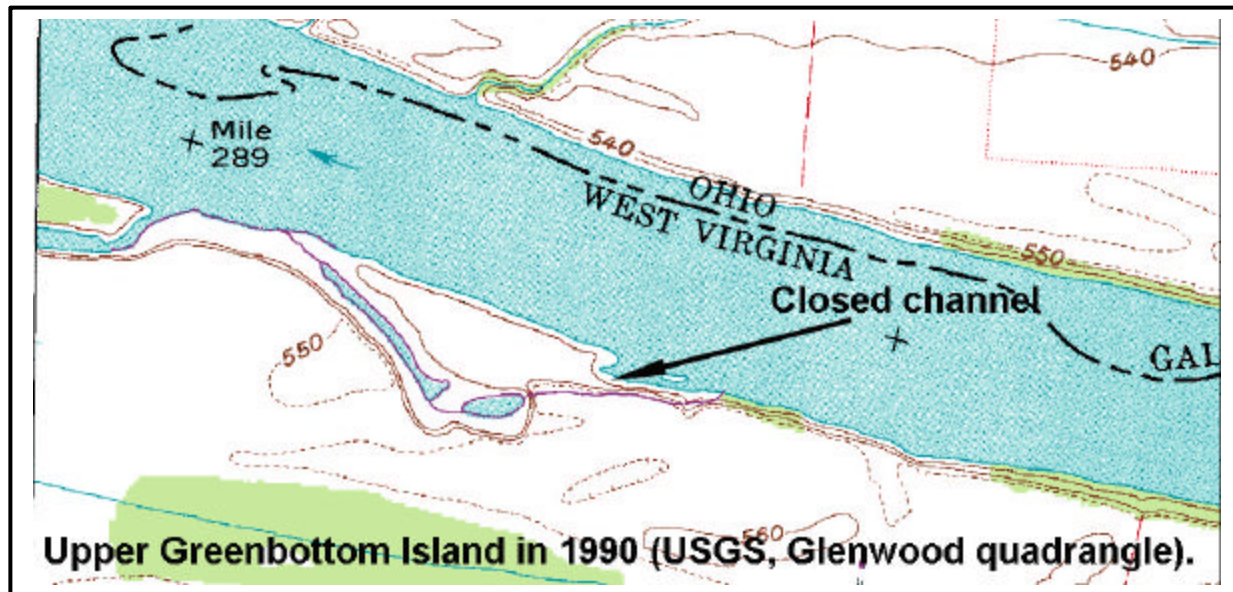


UPPER GREENBOTTOM ISLAND (WV-06)**1.0 Location**

The Upper Greenbottom Island Restoration project area is located in rural Cabell County, West Virginia approximately 2.5 miles northeast of Homestead, West Virginia in the Greenbottom Wildlife Management Area (WMA). The Greenbottom WMA is managed by the West Virginia Department of Natural Resources (DNR). The project is within the Ohio River Greenup Pool. Upper Greenbottom Island extends from Ohio River Mile (ORM) 288.4 to ORM 288.8. The project site is within the jurisdiction of the Huntington District, U.S. Army Corps of Engineers (USACE).



2.0 Project Goal, Description, and Rationale

The primary goal of the Upper Greenbottom Island Restoration project is to create (recreate) an island and associated backchannel at the site. The project will result in the creation of an island and a backchannel which will provide important off-channel aquatic habitat, increased aquatic habitat diversity, and increased fish spawning habitat. Consequently, this habitat restoration project will improve species diversity, facilitate a sustained fisheries resource, and improve the local recreational fishery.

The island will be created by re-creating the old channel along the southern portion of the site. The channel will follow the existing low stream terrace (old river backchannel) at the site. The excavated material from the backchannel creation will be used for the following: 1) increase the size of the created island; 2) enhance wetlands on Upper Greenbottom Island; and 3) facilitate the creation of moist soil units at the Greenbottom WMA.

3.0 Alternatives to Proposed Project

An alternative habitat restoration project to consider would be to excavate portions of the old backchannel for deep water habitat and use the excavated materials to create a series of levees in the old back channel. The small ring levees would create several small moist soil units in the old backchannel. The proximity of this site to the river combined with the low elevation of the site would allow these moist soil units to retain water and create favorable habitats for migratory waterfowl, wading birds, and wetland species. This alternative would not provide the benefits to the aquatic communities that the proposed project would provide because there would be no permanent connectivity to the Ohio River. The alternative would, however, benefit other species and is anticipated to cost less to construct than the proposed project.

4.0 Existing Conditions

Terrestrial/Riparian Habitat: The Upper Greenbottom Island project site is an undeveloped area. The site is a former island and backchannel that has become silted in and naturally reforested over the last 40 years. The predominant habitat is bottomland forest dominated by light mast producing species such as silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), green ash (*Fraxinus pennsylvanica*), and black willow, (*Salix nigra*). Old fields and agricultural fields exist on the high stream terrace south of the project area.

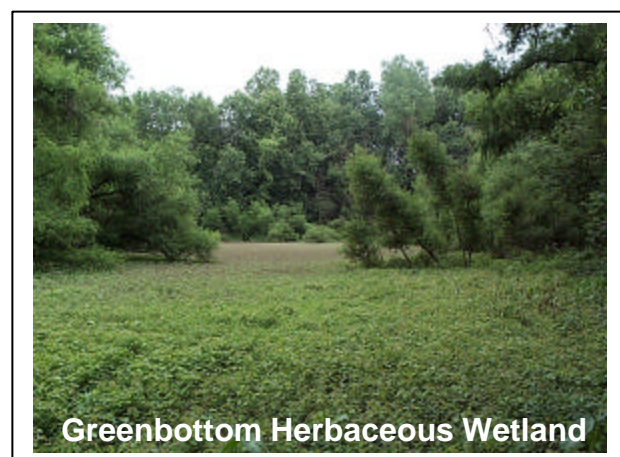


Aquatic Habitats: Aquatic habitats at the Upper Greenbottom site include the Ohio River adjacent to the site and the remnants of the old backchannel in the southern portion of the site. The Ohio River habitat adjacent to the site contains near shore littoral habitat as well as deeper water main channel border habitat. The existing habitat within the remnant backchannel is a shallow slough during most periods of the year. During periods of high river stage, the entire old backchannel is inundated. Throughout normal river stages the old backchannel is an isolated slough without a connection to the river. The slough/backchannel area provides habitat for a variety of fish species including largemouth bass (*Micropterus salmoides*) and bluegill (*Lepomis macrochirus*) (Sheaffer, 1986).



The existing aquatic habitat within Upper Greenbottom Island is influenced by a small levee that separates the existing slough (to the west) from an old borrow pit (to the east) that still retains water (see figure on page 1). This levee apparently facilitated the filling in of the old backchannel because it reduced flow through the backchannel.

Wetlands: The remnant backchannel at Upper Greenbottom Island is very shallow and contains jurisdictional scrub shrub wetlands and herbaceous wetlands. The old backchannel de-waters annually through evapotranspiration, and the subsequent mudflat becomes populated with a variety of wetland plants. Along the higher portions of the backchannel, the area is dominated by bottomland hardwoods, and along the margin of the old backchannel woody shrubs such as buttonbush (*Cephalanthus occidentalis*) and black willow dominate the plant community. In the wetter areas, the plant communities were dominated by a variety of herbaceous plants including smartweeds (*Polygonum* spp.), grasses (*Echinochloa* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.).

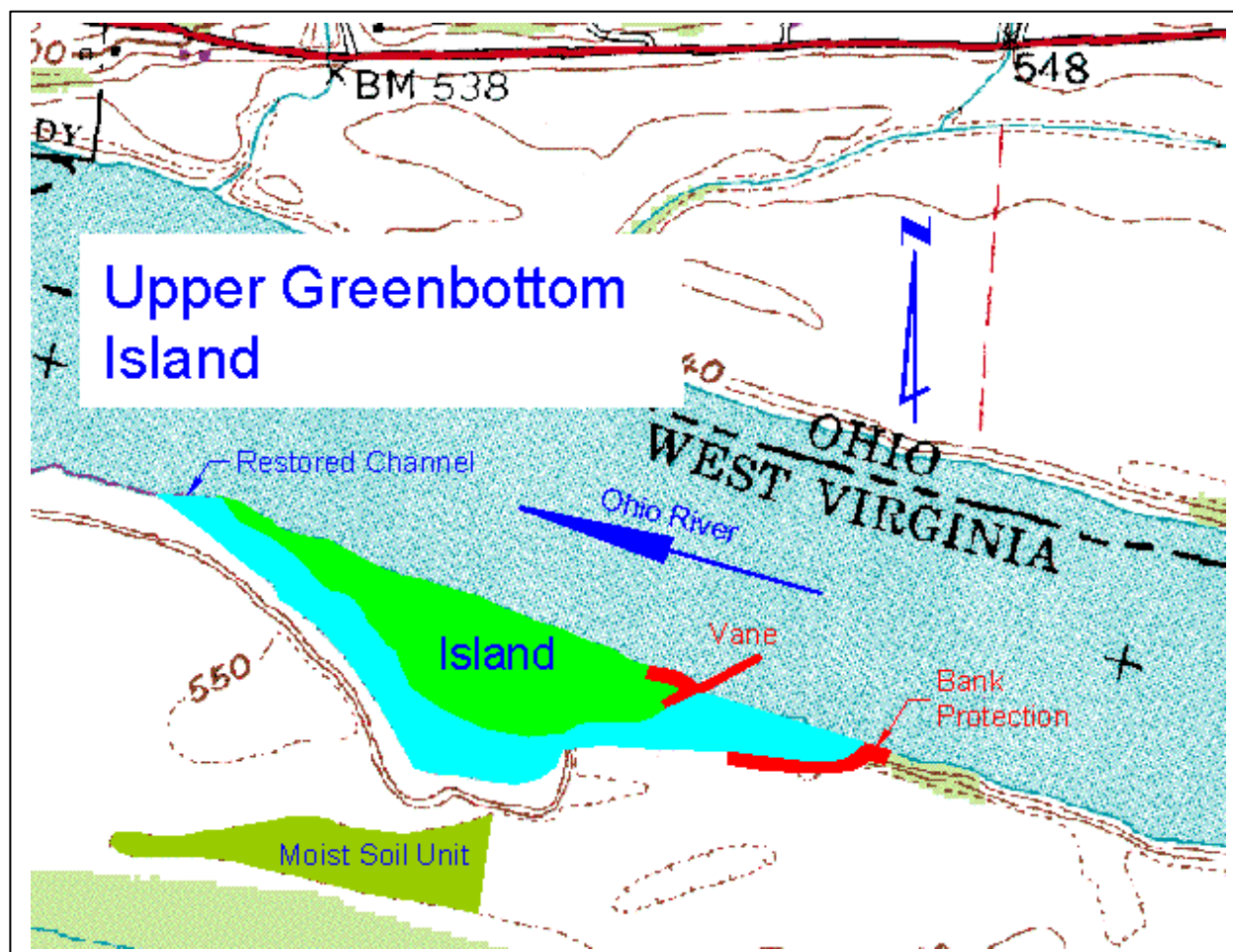


Federally-Listed Threatened and Endangered Species: The U.S. Fish and Wildlife Service (USFWS) has indicated that two federally-listed endangered species, the pink mucket pearly mussel (*Lampsilis abrupta*) and the Indiana bat (*Myotis sodalis*), are known to occur in Cabell County, West Virginia.

The pink mucket is strictly an Ohioan or Interior Basin species found mainly in the Tennessee, Cumberland, and Ohio River systems. The pink mucket is typically found in medium to large rivers in habitats that range from silt to boulders substrates in water depths that range from 0.5 to 8.0 meters. The species is generally associated with moderate to fast flowing water (USFWS, 1985 and USFWS, 1997). There does not appear to be suitable habitat for this species in the immediate vicinity (backchannel areas) of the project area.

The riparian corridor adjacent to the Ohio River and the old backchannel may provide suitable summer roost habitat for the Indiana bat. Preferred tree species would include a mixture of oaks, silver maple, cottonwood, and shagbark hickory (*Carya ovata*) (INHS, 1996).

5.0 Project Diagram



6.0 Engineering Design, Assumptions, and Requirements

6.1 Existing Ecological/Engineering Concern

The Upper Greenbottom Island backchannel has filled with sediments due to several factors. These factors include: raised water levels from the impoundment of Greenup Pool; deposition of Ohio River silt-laden waters, especially during flood events; and wave action from barge traffic.

6.2 Island Creation

Restoration of Upper Greenbottom Island would create 14.5 acres of backchannel habitat. To restore the island and backchannel 10 acres of forested land would have to be cleared. The created channel would vary from 115 to 350 feet wide. The maximum side slope would be 3:1. All excavated material would be used in the levee for the moist soil unit or be spoiled on the island. A vane would be provided at the mouth to divert water into the channel, and provide continuous flow.

6.3 Vane

A vane would be used to divert some of the flow of water into the restored channel and provide submerged aquatic habitat. The structure would be 100 feet in length, pointing upstream at a 60 degree angle. The side slopes would be 1.5 to 1, and the structure would be toed into the sub-grade a minimum of 2 feet. The channel banks would be protected 50 feet up and down stream with rip-rap. The size of the rock used shall be uniformly graded limestone with each rock weighing between 50 and 150 pounds. Normally a well-graded rock would be used, however, a uniform gradation would provide better aquatic habitat.

6.4 Bank Protection

Due to the increased velocities created at the mouth of the island, the channel bank would need to be protected.

Design Features:

- ◆ Clean slope of all trees and brush
- ◆ Excavate bank to provide a 2:1 slope
- ◆ Cover slope with a filter fabric with the following properties:

Table 2. Properties of filter fabric		
Physical Property	Test Method	Requirements
Equivalent Opening Size	Corps of Engineers CWO 2215-77	Equal to greater than U.S. No. 50 Sieve
Tensile Strength @ 20% (Maximum)	VTM-52	30 lbs./linear inch (Minimum)
Puncture Strength	ASTM D751	80 lbs. (Minimum)

- ◆ Rip-rap shall extend up the banks of the channel to a height of 12 feet vertically from the channel bottom (see figure in subsection 5).

6.5 Moist Soil Unit

A small levee 4 high and 460 in length would be constructed in conjunction with a flashboard riser water control structure to provide a moist soil unit. The created wetland would be 9.4 acres. A water control structure constructed of reinforced concrete will be installed within the levee at the lowest end of the pool. The flow line elevation would be below the bottom of the wetland pool. A metal channel would be installed vertically in the flashboard slots because wood and metal logs will not seal against concrete and considerable leakage will occur. The height of the opening would be 3 feet, allowing for 1 foot of freeboard. The width of the opening is 2 feet and would allow for the wetland to be drained in 3 days. A grass lined emergency spillway would be provided to

accommodate storm events. Concrete wingwalls on upper and lower sides of the levee would be used to protect the levee from erosion and reduce seepage around the control structure. Water regulation is achieved by placing “logs” or “boards” in control slots to the desired elevation. Logs are commonly made of treated timber, metal, concrete, or PVC.

7.0 Planning/Engineering Assumptions

Island Creation

- ◆ The site would be cleared of all trees and brush prior to excavation. All cleared material would be left in piles to enhance the wildlife habitat.
- ◆ Excavated material would be used to create the levee for the moist soil unit.

Vane and Bank Protection

- ◆ Average channel velocities are 3 feet per second.
- ◆ All rip-rap material would be shipped by barge to the project site. All costs for shipping are included in the material costs.

Moist Soil Unit

- ◆ The levee would be created using materials excavated during the Island creation.
- ◆ The water control structure is designed to allow complete drainage of the wetland in three days.

- 8.0 Cost Estimate (Construction):** Engineering costs for the proposed project are contained on Table 1. A detailed MCACES cost estimate for the proposed project is included in Appendix C.

Table 1. Engineering Costs.	
Item	Cost
Clearing	\$54,300
Excavation of Backchannel	\$657,300
Vane	\$15,700
Bank Protection	\$36,200
Build Levee	\$4,500
Water Control Structure	\$18,800
Mobilization	\$50,000
TOTAL	\$836,800

- 9.0 Schedule:** The estimated construction time for this project is shown on Table 2.

Table 2. Engineering Costs.	
Item	Time
Clearing	27 Days
Excavation of Backchannel	221 Days
Vane	5 Days
Bank Protection	4 Days
Build Levee	4 Days
Water Control Structure	10 Days
Mobilization	6 Days
TOTAL	277 Days

10.0 Expected Ecological Benefits

Terrestrial/Riparian Habitats: The beneficial impacts of the Upper Greenbottom restoration project would be primarily in-stream. There would be no reasonably foreseeable beneficial impacts to terrestrial/riparian resources as a result of implementing the proposed project.

Aquatic Habitats: Long-term beneficial impacts to aquatic resources would be anticipated as a result of implementing the proposed project. Creating a backchannel at Upper Greenbottom Island would result in long-term beneficial impacts to fishes due to the creation of this habitat type. Backchannel habitat is sparse in the Ohio River, and the creation of additional backchannel habitat will provide improved slow flow habitat, spawning habitat, nursery habitat, potential aquatic plant habitat, and increased habitat diversity within the area. This backchannel restoration will benefit a wide variety of fishes, especially sport fish such as black basses (Sheaffer, 1986).

Wetlands: The beneficial impacts of the Upper Greenbottom restoration project would be primarily in-stream. With the exception of utilizing some of the excavated spoil for a constructed moist soil unit, there would be no other beneficial impacts to wetland resources as a result of implementing the proposed project.

Federally-Listed Threatened and Endangered Species: There would be no reasonably foreseeable beneficial impacts to the pink mucket pearly mussel as a result of implementing the proposed project. Minor long-term beneficial impacts to the Indiana bat may occur as a result of implementing the proposed project. The creation of the backchannel with its adjoining riparian corridor may result in improved summer foraging conditions for the Indiana bat.

Socioeconomic Resources: There would be minor short-term and long-term beneficial impacts to socioeconomic resources as a result of implementing the proposed project. The short-term beneficial impacts would be related to costs and local expenditures associated with the construction of the project. Long-term socioeconomic benefits would be realized through improved recreational fishing opportunities. Long-term indirect beneficial impacts will be realized through local expenditures for fishing tackle, fishing and hunting gear, food, gas, and other associated needs.

11.0 Potential Adverse Environmental Impacts

Terrestrial/Riparian Habitats: There would be long-term adverse impacts to terrestrial/riparian resources as a result of implementing the proposed project. Approximately 10 acres of bottomland hardwood timber would be cleared in order to create the backchannel, thereby resulting in the permanent loss of terrestrial habitat.

Aquatic Habitats: Minor adverse impacts to aquatic biota in the remnant backchannel and old borrow pit may occur as a result of construction activity associated with the recreation of the new backchannel. In addition, sensitive aquatic species immediately downstream from the site could be adversely impacted by degraded water quality associated with sediments displaced during construction, however these adverse impacts to aquatic species would be short term.

Wetlands: There would be long-term adverse impacts to jurisdictional wetlands as a result of implementing the proposed project. Portions of the bottomland hardwood, scrub shrub, and herbaceous emergent wetlands that populate the old backchannel at Upper Greenbottom Island would be removed during the reconstruction of the new backchannel. The functional capacity of approximately 6.0 acres of jurisdictional wetlands will be degraded or removed. The loss of jurisdictional wetlands would be mitigated at an approved wetland mitigation site.

Federally-Listed Threatened and Endangered Species: There would be no reasonably foreseeable adverse impacts to the pink mucket pearly mussel as a result of implementing the proposed project. The potential for minor short-term adverse impacts to Indiana bats exist as a result of implementing the proposed project. Approximately 10 acres of bottomland hardwood timber, primarily silver maple and green ash, would be removed during the construction of the proposed project. This timber would not be considered valuable Indian bat summer roost habitat because the trees are not mature, there is an absence of large dead snags with exfoliated bark, and the tree species present are not the preferred roost trees for Indiana bats. The short-term loss of a portion of the riparian corridor within the project area could result in minor adverse impacts to the Indiana bat.

Socioeconomic Resources: There would be no reasonably foreseeable adverse socioeconomic impacts as a result of implementing the proposed project.

12.0 Mitigation

Minor impacts associated with site restoration may occur during the construction of this project, however, no significant adverse impacts are expected. The use of best management practices and proper construction techniques would minimize adverse water quality impacts.

Potential impacts to Indiana bats from construction of the backchannel could be minimized or eliminated by conducting all vegetation clearing between October 1 and April 1.

Portions of the bottomland hardwood, scrub shrub, and herbaceous emergent wetlands that populate the old backchannel at Upper Greenbottom Island would be removed during the reconstruction of the new backchannel. The functional capacity of approximately 6.0 acres of jurisdictional wetlands will be degraded or removed. Adverse impacts to jurisdictional wetlands would require in-kind mitigation. Mitigation via the creation of new wetlands could occur on the Upper Greenbottom WMA in conjunction with the recreation of the backchannel. As currently envisioned, an approximately 9.4-acre moist soil unit could be constructed south of the backchannel project area (see project diagram).

13.0 Preliminary Operation and Maintenance Costs:

Table 3. Operation and Maintenance Costs		
Maintenance	Frequency	Costs
Dredge Backchannel of Island	35 Years	\$53,240
Moist Soil Unit (Maintenance)	5 Years	\$5,000
Moist Soil Unit (Operations)	1 Year	\$2,000
Repair of Rock Structures	10 years	\$4,000

14.0 Potential Cost Share Sponsor(s)

- ◆ State of West Virginia
- ◆ Barge/towing industry
- ◆ Local industry

15.0 Expected Life of the Project

It is anticipated that the recreated backchannel will maintain adequate depth and flow for a period of 35 years before maintenance dredging would be required.

16.0 Hazardous, Toxic, and Radiological Waste Considerations

Potential impacts of hazardous, toxic, and radiological waste (HTRW) at this concept site were visually assessed during a site visit on June 16, 1999.

Site Inspection Findings

The project area is on the south side of the Ohio River in Cabell County, West Virginia. Green Bottom Island is on the south side of the Ohio River adjacent to the Green Bottom WMA in West Virginia. The West Virginia towns of Homestead and Clover are about one-half mile south of the Ohio River and border the south edge of the Green Bottom WMA.

The following environmental conditions were considered when conducting the June 16, 1999 project area inspection:

Suspicious/Unusual Odors;

- | | |
|--------------------------------------|-----------------------------|
| ◆ Discolored Soil; | ◆ Impoundments/Lagoons; |
| ◆ Distressed Vegetation; | ◆ Drum/Container Storage; |
| ◆ Dirt/Debris Mounds; | ◆ Electrical Transformers; |
| ◆ Ground Depressions; | ◆ Standpipes/Vent pipes; |
| ◆ Oil Staining; | ◆ Surface Water Discharges; |
| ◆ Above Ground Storage Tanks (ASTs); | ◆ Power or Pipelines; |
| ◆ Underground Storage Tanks (USTs); | ◆ Mining/Logging; and |
| ◆ Landfills/Wastepiles; | ◆ Other. |

None of the environmental conditions listed above were observed in the project area.

17.0 Property Ownership & River Access

Selected data on properties immediately adjacent to the concept site was collected from the county courthouse of the respective county of each site. Data collected included map and parcel identification number, property owner's name and mailing address, acreage of the potentially affected parcel, and market value of the parcel. This procedure involved obtaining a plat or parcel map of the site and surrounding area which identified each parcel with a corresponding map and parcel number. The map/parcel identification number was subsequently used to determine the property owner's name and mailing address from records in the County Assessor's or County Auditor's office.

The market value of each parcel as contained in the property tables reflects the assessed valuation to supposedly market value ratio used by the State for taxation purposes. These assessed values reflect 1998 assessments. The assessed valuation ratio is 60 percent for West Virginia.

The above ratio was used to approximate the market value of each property. However, in many instances the resultant market value calculated under the above procedure is considerably below the actual value of the land in the real market. Local real estate brokers could provide a more accurate estimate of actual land values.

The collected property data indicate that the adjacent land is owned by government entities. Access to this site for the purpose of completing the proposed project is readily available.

Table 4. Property Characteristics				
Site Name:		Upper Greenbottom Island		
Location:		Cabell County, West Virginia		
Map/Parcel Number	Owner	Mailing Address	Market Value	Acreage
01/1.1	U.S. Government			85.88
01/2.1	U.S. Government			535.73
* Denotes improvements on property.				

18.0 References

INHS, 1996	Illinois Natural History Survey Reports, March-April 1996. Survey Document #2152. Center for Biodiversity (J. Hofmann).
Sheaffer, 1986	Sheaffer, W.A. and J.G. Nickum. 1986. Backwater areas as nursery habitats for fishes in Pool 13 of the Upper Mississippi River. Hydrobiology No. 136 pp. 131-140.
USFWS, 1985	U.S. Fish and Wildlife Service, 1996. Recovery plan for the pink mucket pearly mussel. Atlanta, Georgia.
USFWS, 1997	U.S. Fish and Wildlife Service, 1997. Species Accounts: pink mucket pearly mussel (<i>Lampsilis abrupta</i>).
USFWS, 1999	U.S. Fish and Wildlife Service, July 6, 1999. Federally Listed Endangered and Threatened Species in West Virginia.

APPENDIX A Threatened & Endangered Species

APPENDIX B Plan Formulation and Incremental Analysis Checklist**Project Site Location:**

The Upper Greenbottom Island Restoration project area is located in rural Cabell County, West Virginia approximately 2.5 miles northeast of Homestead, West Virginia in the Greenbottom Wildlife Management Area (WMA). The project is within the Ohio River Greenup Pool. Upper Greenbottom Island extends from Ohio River Mile (ORM) 288.4 to ORM 288.8. The project site is within the jurisdiction of the Huntington District, U.S. Army Corps of Engineers (USACE).

Description of Plan selected:

The primary goal of the Upper Greenbottom Island Restoration project is to create (recreate) an island and associated backchannel at the site. The project will result in the creation of an island and a backchannel which will provide important off-channel aquatic habitat, increased aquatic habitat diversity, and increased fish spawning habitat. Consequently, this habitat restoration project will improve species diversity, facilitate a sustained fisheries resource, and improve the local recreational fishery.

The island will be created by recreating the old channel along the southern portion of the site. The channel will follow the existing low stream terrace (old river backchannel) at the site.

Alternatives of the Selected Plan:

Smaller Size Plans Possible? **Yes** and description

Create moist soil units in lieu of a backchannel.

Larger Size Plan Possible? **No** and description

Other alternatives? **No**

Restore/Enhance/Protect Terrestrial Habitats? ☐ Yes ☒ Objective numbers met ☐ T2, T1

Restore, Enhance, & Protect Wetlands? ☐ Potential ☒ Objective numbers met ☐ W3

Restore/Enhance/Protect Aquatic Habitats? ☒ Yes ☐ Objective numbers met ☐ A6, A2, A8

Type species benefited: Wide variety of fish species including black basses.

Endangered species benefited: Indiana bat

Can estimated amount of habitat units be determined: Approximately 14.5 acres of backchannel habitat will be created

Plan acceptable to Resources Agencies?

U.S. Fish & Wildlife Service?

State Department of Natural Resources? Yes – West Virginia DNR

Plan considered complete? **Connected to other plans for restoration?**

Real Estate owned by State Agency? Yes **Federal Agency?** Yes

Real Estate privately owned? No

If privately owned, what is status of future acquisition Acquisition is not necessary.

Does this plan contribute significantly to the ecosystem structure or function requiring restoration? What goal or values does it meet in the Ecosystem Restoration Plan?

Restores backchannel habitat. Backchannel habitat is sparse in the Ohio River and the creation of additional backchannel habitat will provide improved reduced current habitat, spawning habitat, nursery habitat, potential aquatic plant habitat and increased habitat diversity within the area. This backchannel restoration will benefit a wide variety of fishes, especially sport fish such as black basses.

Is this restoration plan a part of restoration projects planned by other agencies? (i.e. North American Waterfowl Management Plan, etc.)

No

In agencies opinion is the plan the most cost effective plan that can be implemented at this location?

Can this plan be implemented more cost effectively by another agency or institution?

Yes / No

Who:

From an incremental cost basis are there any features in this plan that would make the project more expensive than a typical project of the same nature? For embayment type plans is there excessive haul distance to disposal site? More expensive type disposal? Spoil that requires special handling/disposal?

Most of the excavation can be done with land based equipment (bull dozers etc.) thereby reducing costs compared to dredging.

Potential Project Sponsor:

Government Entity: _____
Non-government Entity _____

Corps Contractor _____ Date _____

U.S. Fish & Wildlife Representative _____ Date _____

State Agency Representative _____ Date _____

U.S. Army Corps of Engineers Representative _____ Date _____

Terrestrial Habitat Objectives

- T1 Riparian Corridors
- T2 Islands
- T3 Floodplains
- T4 Other unique habitats (canebrakes, river bluffs, etc.)

Wetland Habitat Objectives

- W1 Forested Wetlands: Bottomland Hardwoods
- W2 Forested Wetlands: Cypress/Tupelo Swamps and other unique forested wetlands
- W3 Scrub/Shrub Emergent Wetlands: isolated from the river except during high water and contiguous (includes scrub/shrub wetlands in embayments and island sloughs)

Aquatic Habitat Objectives

- A1 Backwaters (sloughs, embayments, oxbows, bayous, etc.)
- A2 Riverine submerged and aquatic vegetation
- A3 Sand and gravel bars
- A4 Riffles/Runs (tailwaters)
- A5 Pools (deep water, slow velocity, soft substrate)
- A6 Side Channel/Back Channel Habitat
- A7 Fish Passage
- A8 Riparian Enhancement/Protection

APPENDIX C Micro Computer-Aided Cost Engineering System (MCACES)